

## **APPENDIX F**

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### **PESTICIDES AND HERBICIDES RECOMMENDED AS TARGET ANALYTES**

**Table F-1. Pesticides and Herbicides Recommended as Target Analytes**

Pesticide	Family	Use	Registration	EPA toxicity class <sup>a</sup>	EPA carcinogenicity classification <sup>b</sup>
<b>Metal Containing Pesticides</b>					
Arsenicals (including arsenic acid, arsenic trioxide, copper acetoarsenite, lead arsenate, calcium arsenate, sodium arsenite)	Inorganic arsenicals	A variety of inorganic arsenic compounds are used as herbicides, fungicides, insecticides and rodenticides, but registered uses of some were superseded because of their hazard to man and other nontarget species ( <i>Farm Chemicals Handbook</i> , 1989)	Some inorganic arsenic compound registrations have been canceled; others are under restricted use application and others are in special review (U.S. EPA, 1993)	I	A
Tributyltins (tribylytin oxide)	Organotins	A variety of organotin compounds are used as wood preservatives, antifoulants, biocides, and disinfectants ( <i>Farm Chemicals Handbook</i> , 1989)	Some organotin compounds have been actively registered since the mid-1960s. Several registrations have been canceled or manufacturers discontinued production (U.S. EPA, 1988a)	II	D
<b>Organochlorines</b>					
Chlordane	Chlorinated cyclodiene	Termite control. Historically used for control of fire ants, cutworms, grasshoppers, and on other insects on corn, grapes, strawberries, and other crops and as a dip for nonfood roots and tips of plants (Hartley and Kidd, 1987).	In March 1978, EPA issued a cancellation proceeding on chlordane, allowing only limited use on certain crops and pests until July 1983, but no use thereafter except for underground termite control (43 FR 12372). All uses were canceled in 1988.	II	B2
DDT	Chlorinated hydrocarbon	Insecticide	All uses in U.S. were canceled as of January 1, 1973, except for emergency public health uses.	III	B2
Dicofol	Chlorinated hydrocarbon	Miticide/pesticide on many fruit, vegetable, ornamental, and field crops. Used to control mites on cotton and citrus (80%). Other uses include control of mites on ornamental plants, fruits, and vegetables. Most of the usage is in California and Florida (U.S. EPA, 1998b).	Active registration since 1957. <sup>c</sup>	III	C <sup>d</sup>
Dieldrin	Chlorinated cyclodiene	Formerly used to control locusts, tropical disease carriers (e.g., mosquitoes), and termites, use as wood preservative, and moth proofing for woolen clothes and carpets (Worthing, 1991).	All uses on food products were suspended in 1974 (ATSDR, 1993). All registered uses in the U.S. were canceled in 1985.	II	B2
Endosulfan (I and II)	Chlorinated bicyclid sulfite	Insecticide and acaricide on citrus, deciduous, small fruits, coffee, tea, fiber crops, forage crops, forest, grains, nuts, oil crops, tobacco, ornamentals, and vegetables (ATSDR, 1999).	Active registration since 1954. <sup>c</sup>	I	E <sup>e</sup>

See notes and references at end of table.

(continued)

Table F-1. (continued)

Pesticide	Family	Use	Registration	EPA toxicity class <sup>a</sup>	EPA carcinogenicity classification <sup>b</sup>
Endrin	Chlorinated cyclodiene	Historically used to control cotton bollworms, as a foliar treatment for citrus, potatoes, small grains, apple orchards, sugarcane, and as flower and bark treatment on trees. Endrin has also been used to control populations of birds and rodents (U.S. EPA, 1980).	In 1964, endrin persistence in soils led to cancellation of its use on tobacco (U.S. EPA, 1980). By 1979, specified uses on cotton, small grains, apple orchards, sugarcane and ornamentals were also restricted (44 FR 43632). All uses in the U.S. were canceled in 1984 (U.S. EPA, 1984a).	I	D
Heptachlor epoxide	Chlorinated cyclodiene	Heptachlor epoxide is an oxidation product of heptachlor. It is a contaminant of both heptachlor and chlordane. Heptachlor was widely used as a termiticide and insecticide, primarily for ant control (Hodges, 1977). Chlordane was widely used for termite control as well as for control of fire ants, cutworms, grasshoppers and other insects (Hartley and Kidd, 1987).	Restrictions on heptachlor were first instituted in 1978 and heptachlor has not been sold in the U.S. since August 1987 (ATSDR, 1987).	NA	B2
Hexachlorobenzene	Chlorinated benzene	Primary use prior to 1985 was as a fungicide seed protectant in small grain crops, particularly wheat.	Registration for all uses was canceled in 1984 (Morris and Cabral, 1986).	IV	B2
Lindane (γ-hexachloro-cyclohexane)	Chlorinated hydrocarbon	Seed treatments, soil treatments for tobacco transplants, foliage applications on fruit and nut trees, vegetables, and wood and timber protection (ATSDR, 1998).	Active registration. Use of lindane in smoke fumigation devices for indoor domestic purposes was banned in 1985 (48 FR 48512, 50 FR 5424). Use in dog dips permitted only for veterinary use (U.S. EPA, 1985a). Application permitted only under supervision of certified applicator (U.S. EPA, 1985a). <sup>c</sup>	II	B2 <sup>e</sup>
Mirex	Chlorinated cyclodiene	Historically used primarily in fire ant control in southeastern states (Kutz et al., 1985) and was used industrially as a fire retardant and polymerizing agent in plastics under the name dechlorane (ATSDR, 1995).	Registration for all uses on field crops was canceled in 1977 (41 FR 56703) (NAS, 1978).	II	B2 <sup>f</sup>
Toxaphene	Chlorinated camphene	Historically used extensively on cotton ( <i>Farm Chemicals Handbook</i> , 1989).	Registration for all uses was canceled in 1982 (47 FR 53784) and uses were canceled in 1990 (55 FR 31164-31174).	II	B2

See notes and references at end of table.

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Table F-1. (continued)

Pesticide	Family	Use	Registration	EPA toxicity class <sup>a</sup>	EPA carcinogenicity classification <sup>b</sup>
<b>Organophosphates</b>					
Chlorpyrifos	Heterocyclic organothio-phosphate	Insecticide primarily used to control soil and foliar insect pests on cotton, peanuts, and sorghum (Worthing, 1983; U.S. EPA, 1986a). In addition, it is used to control root-infesting and boring insects on a variety of fruits (e.g., citrus crops, apples, bananas, peaches, grapes, nectarines), nuts (e.g., almonds, walnuts), vegetables (e.g., beans, broccoli, brussel sprouts, cauliflower, soybeans, cabbage, peas) and field crops (e.g., alfalfa and corn) (U.S. EPA, 1986a) and to control ticks on cattle and sheep (Thomson, 1985). As a household insecticide it has been used to control ants, cockroaches, fleas, and mosquitoes (Worthing, 1983) and is registered for use in controlling subsurface termites in California (U.S. EPA, 1983).	Active registration since 1965 (U.S. EPA, 1984b). <sup>c</sup> Use patterns will change by the end of 2001. Virtually all residential use will end, as will use on tomatoes. Use on apples and grapes will be substantially reduced (U.S. EPA, 2000).	II	E <sup>g</sup>
Diazinon	Heterocyclic organothio-phosphate	Insecticide and nematicide for control of soil insects and pests of fruits, vegetables, tobacco, forage, field crops, range, pasture, grasslands, and ornamentals. Used to control cockroaches and other household insects; and grubs and nematodes in turf; as a seed treatment and for fly control ( <i>Farm Chemicals Handbook</i> , 1989).	Active registration since 1952 (U.S. EPA, 1986b). <sup>c</sup>	II	Not likely <sup>e</sup>
Disulfoton	Aliphatic organothio-phosphate	Systemic insecticide and acaricide on grain, nut, cole, and root crops; pome, strawberry, and pineapple fruits; forage, field and vegetable crops, sugarcane, seed crops, forest plantings, ornamentals and potted plants (houseplants) (U.S. EPA, 1984c).	Active registration since 1958 (U.S. EPA, 1984c). <sup>c</sup>	I	E <sup>e</sup>
Ethion	Organothio-phosphate	Insecticide (nonsystemic) for control of leaf-feeding insects, mites, and scale insects. Citrus accounts for 86%-89% of total pounds of ethion used in the U.S. with the remaining 11%-14% applied to cotton, a variety of fruit trees, nut trees, and vegetables (U.S. EPA, 1989).	Active registration since 1965 (U.S. EPA, 1989). <sup>c</sup>	II	E <sup>e</sup>

See notes and references at end of table.

(continued)

Table F-1. (continued)

Pesticide	Family	Use	Registration	EPA toxicity class <sup>a</sup>	EPA carcinogenicity classification <sup>b</sup>
Terbufos	Organothiophosphate	Systemic insecticide and nematicide on corn, sugar beets, and grain sorghum (U.S. EPA, 1985c).	Active since 1974; however, granular end-use products containing 15% or more terbufos were classified as "Restricted Use" after September 1985 (U.S. EPA, 1985c; 1985b). <sup>c</sup>	I	E <sup>e</sup>
<b>Chlorophenoxy Herbicides</b>					
Oxyfluorfen	Diphenyl ether	Pre- and postemergence herbicide for a wide spectrum of annual broadleaf weeds and grasses in apples, artichokes, corn, cotton, tree fruit, grapes, nuts, spearmint, peppermint, certain topical plantation, and ornamental crops ( <i>Farm Chemicals Handbook</i> , 1989)	Active since 1979. <sup>c</sup>	IV	C <sup>e</sup>

<sup>a</sup> Designations are from EPA (1998a):

- I = Oral LD<sub>50</sub> up to and including 50 mg/kg in laboratory animals.
- II = Oral LD<sub>50</sub> >50 through 500 mg/kg in laboratory animals.
- III = Oral LD<sub>50</sub> >500 through 5,000 mg/kg in laboratory animals.
- IV = Oral LD<sub>50</sub> >5,000 mg/kg in laboratory animals.
- NA = No value available.

<sup>b</sup> Designations are from IRIS (1999) unless otherwise noted: NA = not available; A = human carcinogen; B1, B2 = probable human carcinogen; C = possible human carcinogen; D = not classifiable as to human carcinogenicity; E = evidence of noncarcinogenicity for humans.

<sup>c</sup> This pesticide has an active registration for agricultural use. The EPA Office of Pesticide Programs is responsible for registration and reregistration of pesticides. The 1988 Amendment of FIFRA requires EPA to reregister each "registered pesticide containing any active ingredient contained in any pesticide first registered before November 1, 1984, except for any pesticide as to which the Administration has determined, after November 1, 1984 . . . that—(1) there are no outstanding data requirements; and (2) the requirements of section 3(c)(5) have been satisfied" (U.S. EPA, 1988b). The Agency will review all relevant data submitted by the registrant for each pesticide reregistration and will use the data to conduct a risk assessment. Any subsequent regulatory action will be based on the results of the risk assessment. If the data submitted are incomplete at the predetermined review time, the pesticide may be suspended. Under the provisions of the Food Quality Protection Act of 1996, all pesticides with active registrations are undergoing review to determine if restrictions on their use are necessary for the protection of the health of infants and children. Contact EPA for further information on the status of the review process for specific pesticides.

<sup>d</sup> EPA carcinogenicity classification based on Reregistration Eligibility Decision (RED) Dicofol (U.S. EPA, 1998b).

<sup>e</sup> EPA carcinogenicity classification based on List of Chemicals Evaluated for Carcinogenic Potential (U.S. EPA, 1999).

<sup>f</sup> EPA carcinogenicity classification based on HEAST, (1997).

<sup>g</sup> EPA carcinogenicity classification based on Revised Human Health Risk Assessment for Chlorpyrifos (U.S. EPA 2000).

**Note:** The potential human toxicity of currently regulated pesticides is undergoing assessment as a result of provisions of the Food Quality Protection Act (1996). Consult EPA for the latest assessment information on the Internet at: <http://www.epa.gov/oppsrrd1/op/status.htm>.

Table F-1. (continued)

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**Table F-1. (continued)**

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